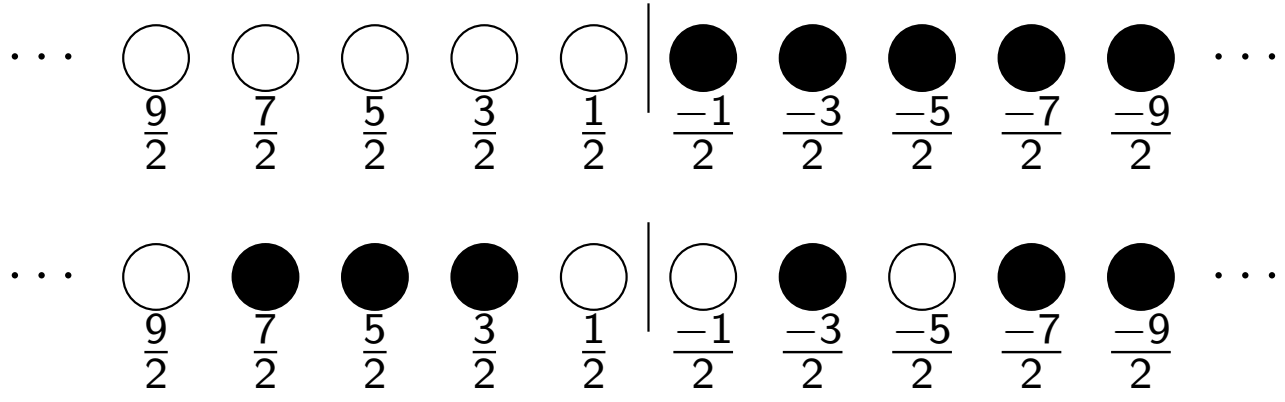
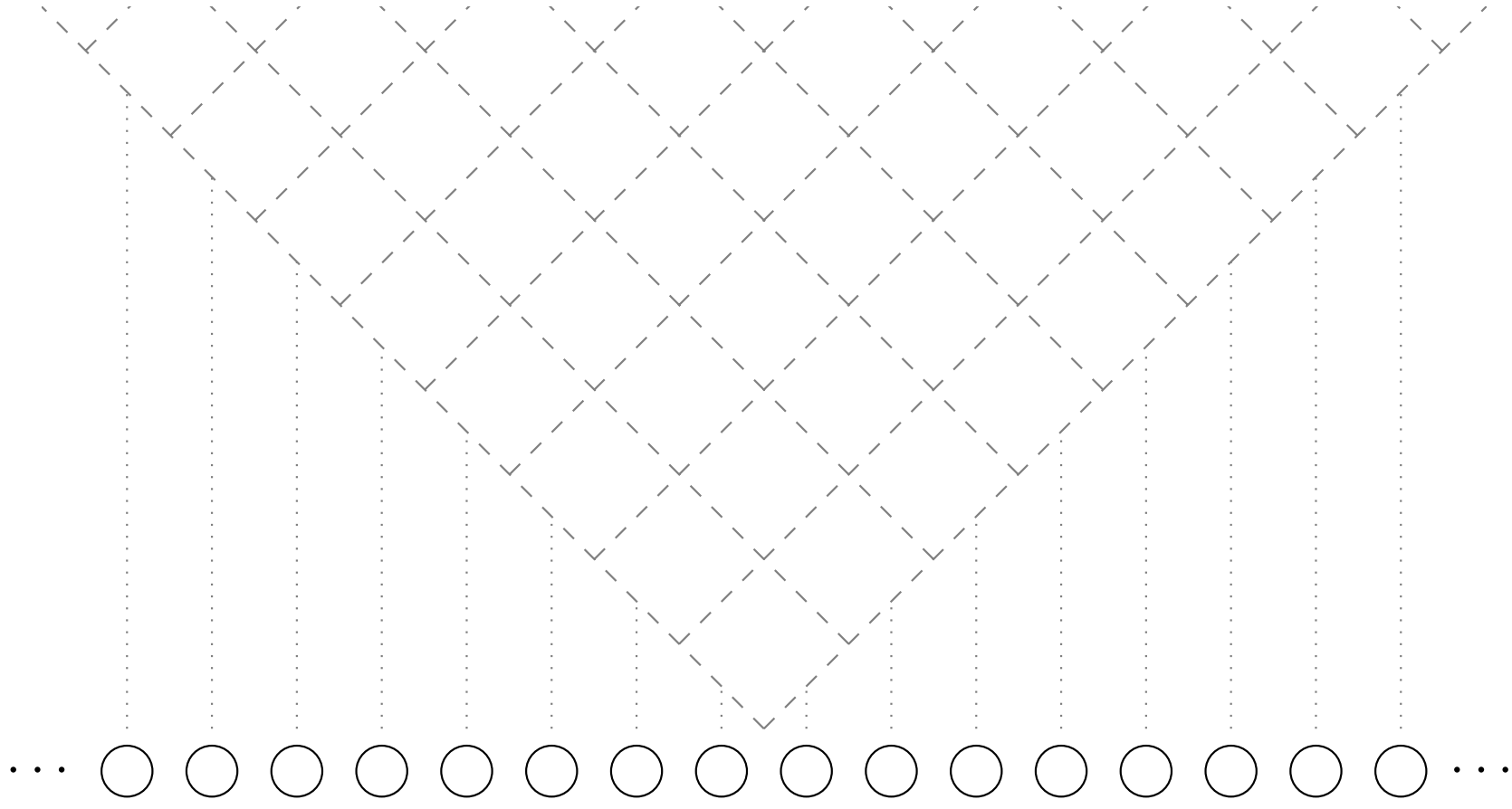
Dirac's Electron Sea

- Energy levels of electrons are $\mathbb{Z} + 1/2$, e.g. $1/2$, -7/2, $101/2$.
- Each energy level is either filled or empty
- Vacuum is when every negative energy state is filled, no positive levels filled
- A missing negative energy state corresponds to a positron with that energy
- A *state* is finite number of electrons and positrons

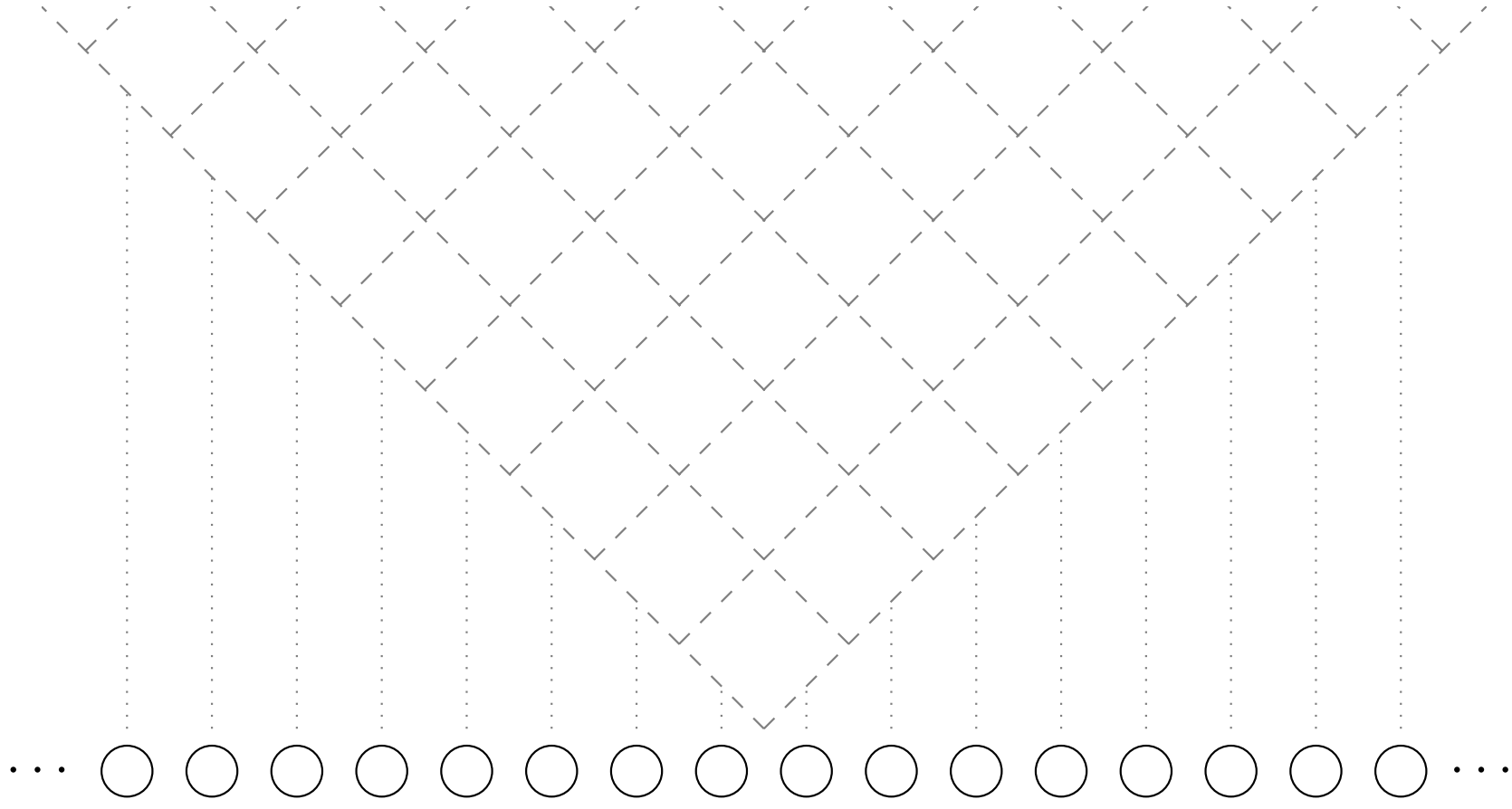
Visualize states as *Maya Diagrams*



Charge 0, energy n states $\overset{1:1}{\longleftrightarrow}$ partition of n



Cells, hooks, arms and legs in fermionic viewpoint?



Cells, hooks, arms, and legs in fermionic viewpoint!

- A cell $\square \in \lambda$ is determined by its hand and foot.
- Given an E in boundary that appears before an S in boundary path, there's a cell that has that E as its hand, and that S as its foot. Such a pair (E, S) is called an *inversion*
- In fermionic viewpoint, an inversion is a pair of energy levels $e_1 > e_2$, with e_1 filled, and e_2 empty.
- Moving the electron with energy e_1 to e_2 corresponds to removing the rim hook of $\square$ so $h(\square) = e_1 - e_2$
- $a(\square)$ is the number of empty states between e_1 and e_2
- $\ell(\square)$ is the number of filled states between e_1 and e_2

Abacus

To analyze hook length divisible by k, spread the electrons over k runners: